PATENT

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re Application of:
MONSANTO TECHNOLOGY LLC

Serial No.: PCT/US02/34079

International Filing Date: October 24, 2002

For: AROMATIC METHYL TRANSFERASES AND USES THEREOF

Atty. Dkt. No.: MONS:043WO

CERTIFICATE OF EXPRESS MAILING
NUMBER: EV 326409144 US
DATE OF DEPOSIT: December 22, 2003

RESPONSE TO WRITTEN OPINION

Mail Stop PCT
Commissioner for Patents
P.O. Box 1450
Alexandria, VA 22313-1450

Sir:

This response is filed under PCT Rule 66.3 and is responsive to the Written Opinion mailed 23 October 2003, regarding the above captioned application. A response to the Written Opinion is due December 23, 2003.

Should any fees be required for any reason relating to the enclosed materials, please deduct said fees from Fulbright & Jaworski Account No.: 50-1212/MONS:043WO. Please date stamp and return the enclosed postcard to acknowledge receipt of these materials.

AMENDMENTS

Applicant has submitted herewith a substitute sheet containing amended claim 1. The change to the claim is to insert the word "vascular" in claim 1. The arguments below pertaining to the novelty and inventive step of claims 1 and 2 also pertain to the claims as amended.

Applicant also amends claim 7 by inserting word "vascular".

The text of the remaining claims remain unchanged.

REMARKS

Applicant is responding to the Written Opinion, mailed 23 October 2003. In that document, the International Searching Authority contends that claim Nos. 1-2 lack novelty under PCT Article 33(2) as being anticipated by WO 00/10389 (UNIVERSITY OF NEVADA), 02 March 2000. For explanation, the Written Opinion contains the following statement:

> WO 00/10380 teaches a nucleic acid molecule encoding a plant polypeptide having 2-methylphytylplastoquinol methyltransferase activity, obtained from Synechocystis PCC6803 [citation omitted]. While WO00/10380 does not explicitly teach a plant polypeptide having 2-methylphytylplastoquinol methyltransferase activity obtained from *Arabidopsis thaliana*, Columbia ecotype, *Arabidopsis thaliana*, Landsberg ecotype, corn, soybean rice, *Allium*, *Brassica*, and *Gossypium*, the plant polypeptide having 2-methylphytylplastoquinol methyltransferase activity taught by WO 00/10380 would necessarily be the same as the claimed plant polypeptides, as the rejected claims cite no structural limitations that distinguish 2-methylphytylplastoquinol methyltransferases obtained from *Arabidopsis thaliana*, Columbia ecotype, *Arabidopsis thaliana*, Landsberg ecotype, corn, soybean rice, *Allium*, *Brassica*, and *Gossypium* from a *Synechocystis* 2-methylphytylplastoquinol methyltransferase polypeptide.

Applicant respectfully submits that the conclusion of anticipation by the Written Opinion is incorrect. As admitted in the Written Opinion, WO 00/10380 does not explicitly disclose the invention of claims 1 and 2 in that it does not teach nucleic acids encoding plant polypeptides. WO 00/10380 discloses a *Synechocystis* nucleic acid

molecule encoding a *Synechocystis* polypeptide. *Synechocystis* is not a plant, but rather is a photosynthetic bacteria. WO 00/10380 at p.5. The Written Opinion incorrectly concludes that the "plant polypeptide having 2-methylphytylplastoquinol methyltransferase activity taught by WO 00/10380 ***would necessarily be the same as the claimed plant polypeptides***". Evidence that this conclusion is incorrect is provided in part by *Plant Cell*, 15:2343:2356 (2003) (attached hereto as Exhibit A), where Dellapenna, the named inventor on WO 00/10380, and wrote the following paragraphs:

> The pathway and enzymes for tocopherol synthesis are homologous in cyanobacteria and plants except for 2-methyl-6-phytyl-1, 4-benzoquinone/2-methyl-6-solanyl-1,4-benzoquinone methyltransferase (MPBQ/MSBQ MT).
>
> (abstract, line 2)

> The only tocopherol pathway enzyme that has not been cloned from plants is MPBQ/MSBQ MT... MPBQ/MSBQ MT has been cloned and characterize from Synechocystis sp PCC6803 [citation omitted], but despite the high degree of evolutionary conservation between plants and cyanobacteria for other tocopherol pathway enzymes, no obvious orthologs could be identified in the completed Arabidopsis and rice genomes and numerous plant EST databases. The low sequence identity between the cyanobacterial and plant MPBQ/MSBQ MTs suggests that they are nonorthologous, functionally equivalent enzymes that arose independently during the evolution of plants and cyanobacteria.
>
> (p. 2345)

> ...these combined data suggest that, unlike the other enzymes of the tocopherol pathway, Arabidopsis and Synechocystis sp PCC 6803 MPBQ/MSBQ MTs share little identity at the level of the primary amino acid sequence.
>
> (*Id.*, right column)

> These data demonstrate conclusively that Arabidopsis VTE3 is the functional equivalent of *Synechocystis* sp PCC 6803 MPBQ/MSBQ MT.
>
> (p. 2350, left column)

> Although VTE3 and *Synechocystis* sp PCC 6803 MPBQ/MSBQ MT have conserved enzymatic activities [citation omitted], the two proteins are highly divergent in their primary amino acid sequences, with overall identity of 18%.
>
> (*Id.*, right column)

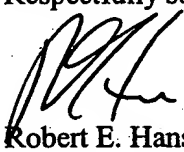
Further support for the lack of teaching of the present invention in WO 00/10380 is demonstrated by the protein sequence comparisons of the *Synechocystis* SEQ ID NO: 1 of WO 00/10380 to SEQ ID NOs:16, 22-28, and 33-38 of the present invention. The highest homology between SEQ ID NO: 1 of WO 00/10380 and any of such sequences is 36%, using BESTFIT. Moreover, that homology is achieved over only a region of the amino acid sequence numbering 102 or less amino acids out of the total 318 amino acids in SEQ ID NO: 1 of WO 00/10380. Outside of that amino acid region, the program does not indicate any degree of homology.

B. Conclusion

In light of the foregoing comments, the applicants respectfully submit that the present claims are novel, inventive and possess industrial applicability. An IPER stating such conclusions is therefore respectfully requested.

Please acknowledge receipt of this document via facsimile no. 512-536-4598.

Respectfully submitted,



Robert E. Hanson
Reg. No. 42,628
Attorney for Applicants

FULBRIGHT & JAWORSKI, LLP
600 Congress Ave, Suite 2400
Austin, Texas 78701
(512) 536-3085

Date: December 22, 2003

What is claimed is:

1. A substantially purified nucleic acid molecule encoding a vascular plant polypeptide having 2-methylphytylplastoquinol methyltransferase activity.

2. The substantially purified nucleic acid molecule of claim 1, wherein said plant is selected from the group consisting of *Arabidopsis thaliana*, Columbia ecotype, *Arabidopsis thaliana*, Landsberg ecotype, corn, soybean, rice, *Allium*, *Brassica*, and *Gossypium*.

3. The substantially purified nucleic acid molecule of claim 1, wherein said nucleic acid molecule encodes a polypeptide molecule comprising an amino acid sequence selected from the group consisting of SEQ ID NOs: 16 through 38.

4. The substantially purified nucleic acid molecule of claim 1, wherein said nucleic acid molecule encodes a mutant plant polypeptide having 2-methylphytylplastoquinol methyltransferase activity.

5. The substantially purified nucleic acid molecule of claim 4, wherein said nucleic acid molecule is a mutant gene selected from the group consisting of hdt2, hdt6, hdt9, hdt10, and hdt16.

6. A substantially purified nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 3 through 14, and complements thereof.

7. A substantially purified vascular plant polypeptide molecule having 2-methylphytylplastoquinol methyltransferase activity.

8. The substantially purified plant polypeptide molecule of claim 7, wherein said polypeptide molecule is native to an organism selected from the group consisting of *Arabidopsis thaliana*, Columbia ecotype, *Arabidopsis thaliana*, Landsberg ecotype, corn, soybean, rice, *Allium*, *Brassica*, and *Gossypium*.

9. A transformed plant comprising an introduced nucleic acid molecule comprising a nucleic acid sequence selected from the group consisting of SEQ ID NOs: 1, 2, 8 through 15, and complements thereof.

EXHIBIT A